

Annual Audit of Work Package 7: Beam Diagnostics

October 10, 2014 9:00 – 12:00

Attendees: U. Raich (CERN), L. Lari, A. Jansson, T. Shea, A. Ponton, E. Tanke, Edgar S., C. Darve, M. Conlon, D. McGinnis, S. Molloy, M. Eshraqi, H. Hassanzadegan, J. G. Weisend II (Chair)

1) General Comments

The beam diagnostics team has made significant progress since the last review with many beam diagnostic items moving into prototype production and some moving into series production. The types, number of devices and their placement have been determined mainly by comparing the ESS needs to similar machines (SNS, Linac-4). At first sight the decisions seem reasonable but they should be verified by optics simulations and integration studies.

This work package has had to respond to 3 major changes over the past two years: the accelerator redesign, the need for more In Kind Contributions and general reduction in available funding. The response to these changes has varied. In terms of In Kind Contributions, the group has done a very good job of developing potential in kind contributors and has certainly moved the focus of the work package from a "build in house" approach to a more "In Kind Contribution" approach. While a more in kind approach adds complications and risks (particularly in the areas of standardization and information transfer from the partner labs) it is necessitated by the available project funding structure. The work package team has also adjusted the scope of the instruments in response to the accelerator redesign. Efforts on cost reduction have been less successful. While a significant number of instruments have been eliminated, much of the potential cost savings have been moved to the labor side of the work package with the result of a reduced amount of cost savings. This issue needs to be addressed by ACCSYS management.

Staffing for the work package has grown significantly over the past year and any additional staff increases, or potentially any replacements of existing staff need to be carefully considered in the context of the overall needs for the ACCSYS project.

No technical show stoppers were identified in the course of the review. There was disagreement on the use of button vs. stripline BPMs and their relative accuracies. This should be solved through the requirements process that sets desired accuracy requirements or specifies a specific technology to be used for the BPMs.

The work package still needs to be replanned within the Primavera schedule and this should be a priority over the course of the next months. It is recognized that the distributed, parallel nature of this work package makes planning difficult but it does have to be done. The setting of level 4 and 5 milestones also has to be optimized, probably based on need by dates set by linac geometry.

Beam diagnostics are intimately tied to commissioning and operations plans. While a draft commissioning plan exists, more effort is needed to tie these two items together in a manner consistent with the overall ESS schedule limits. Regarding the broader topic of ESS commissioning it is worth quoting Uli Raich of CERN verbatim:

"It seems clear to me that as many tests as possible should be made before final installation in the tunnel. This concerns mainly the source and LEBT, but also the RFQ and the MEBT. It would be very advisable to have a test stand that allows to commission the low energy section of the machine prior to its final installation. This will allow the system designer to verify his design decisions and it will also allow the responsible ESS engineer to become familiar with the device, verify its functioning and compare its performance with respect to the requirements given to the designer. Early thorough testing will allow to speed to final commissioning."

There currently is a plan to test the ion source and LEBT together before they are sent to ESS. There is also a desire (and a place holder in the schedule) to test the ion source, LEBT, RFQ and MEBT at Saclay prior to installation at ESS. The amount of time available for such a test is unclear and will probably have to be created by reducing the amount of commissioning time planned in the ESS tunnel. Such a trade off may well make sense. A formal decision on the commissioning approach and its embodiment in the project Primavera schedule should be a priority.

Overall, the work package has made significant progress and have has implemented or started to address the recommendations from the last audit. A very talented and strong team has been assembled. The Work package is on track to meet its goals and milestones, but particular attention has to be paid, both by the Work Package team and the broader ACCSYS project, to implementing the recommendations below in order for the work package to be successful.

2) Response to Charge

- Has the work package reached a level of technical maturity consistent with its current status on the schedule?

Yes

- Are there any technical concerns regarding the work package?

No

- Is any additional development or testing required for the work package to meet its goals? Describe the results from any prototype testing.

No

- Are the requirements for the work package well understood and documented? Specifically, will the requirements needed to support procurement of production hardware be ready in time to allow the procurements to keep to schedule?

Generally yes, although formal definition of the level 4 and 5 requirements needs to be done. This work should be optimized by both a need by date and by linac geography.

- What is the status of IKC for this Work Package? When will the need for HOA or final IKC agreements start to impact the WP schedule

The IKC has been greatly expanded for this work package. HOAs or final agreements will be needed with possible contributors (RAL, Trieste, CEA etc.) in the first half of 2015.

- Are all the interfaces between the work packages and other work packages and products properly defined, understood and agreed upon?

Generally yes, see comments on requirements above and recommendations below.

- Have all safety issues in the work package been properly identified and dealt with?

Yes

- Are there sufficient resources (funding, staff) assigned to the work package to allow the goals of the work package to be met?

Yes. Funding should be reviewed by ACCSYS management to determine if additional savings can be made.

- Are there decisions that need to be made in order to allow the work package to meet scope, cost and schedule

Yes, A baseline plan for pretesting (including possible offsite tests) and commissioning of the accelerator sections must be created by ACCSYS Management

- Are there any outstanding procurements or personnel actions that are limiting the progress on the Work Package?

No

- Is the Work Package on track to meeting its milestones?

Yes but replanning is needed to generate a more optimal set of milestones and to link it to the broader project schedule.

- Are there any adjustments to the schedule and milestones that should be made?

Replanning of the Work Package must be carried out with the planners to create a more consistent plan.

- Are there any changes to the work package scope that should be made?

No

- Have PDR and CDR reviews been scheduled to allow reviews of components or systems in time to keep to procurement schedules? Describe any schedule developed.

This work has not been started yet and will be looked at once the replanning is complete.

- What is the status of last year's recommendation for this work package?

See below.

3) Recommendations:

1. Replan work package and move into broader ACCSYS Primavera schedule as soon as possible so tracking of progress is more accurate and easier to understand.
2. Consider changing the organization of the Work Package staff so that there is unambiguous links between the work package and of IKC partners.
3. Designate a single person to be responsible for system integration and any device to be installed into the machine should pass through him/her. (Note this may already exist in the Chief Engineer or Lead Engineer)
4. Solve the space issue between instrumentation and vacuum valves in DTL tanks.
5. Create a baseline plan for pretesting (including possible offsite beam tests) and commissioning of the accelerator sections. ACCSYS Management should create this plan.
6. Adjust the design of the LWU to meet the level 2 requirement that we have to be able to get under the LWU for personnel access.
7. Adjust BPM requirements to show minimum required accuracy or to require a specific BPM technology.
8. Check available space in tunnel to ensure that systems, such as mirror systems have room in the tunnel. Create place holders as required.
9. Describe and list the 2-D 'layout' drawings that Accelerator Integration Group (AIG) requires for populating Linac Lego, and send this to John Weisend for communicating to the WP Leaders.
10. Review the Work Package costs to see if additional saving may be possible. ACCSYS Management should carry out this review.

4) Status of Last Year's Recommendations

1. Review, at a project level, the decision to use MicroTCA technology for both the beam instrumentation and in other areas of ESS. Is the risk due to needed development and limited suppliers too high to justify any benefits?

This has been done and MicroTCA remains the baseline choice for these applications.

2. Determine clearly and document the scope of beam instrumentation and the normal conducting front end (WP3) for the beam instrumentation in the NCFE, particularly within the DTL.

This is underway and nearly complete. Some details based on NCFE In Kind Contributions and commissioning plans remain to be fixed.

3. Determine clearly and document the scope of beam instrumentation and the vacuum (WP12) for the beam instrumentation in the LWUs

This has been completed

4. Evaluate, for value engineering, the need for insertable beam dumps. This discussion should include: Beam Instrumentation, Beam Physics, the Chief Engineer and others (possibly including external experts)

This has been completed. The large expensive one has been engineered out, but we have kept the medium energy one and it is part of the commissioning plan

5. Optimize beam instrumentation in response to the accelerator redesign

This is nearly done but more work needs to be done with regards to the commissioning plan.